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STANDARDISATION AND COMPATIBILITY OF WATER WASH RESISTANT GREAS--ETC(U)
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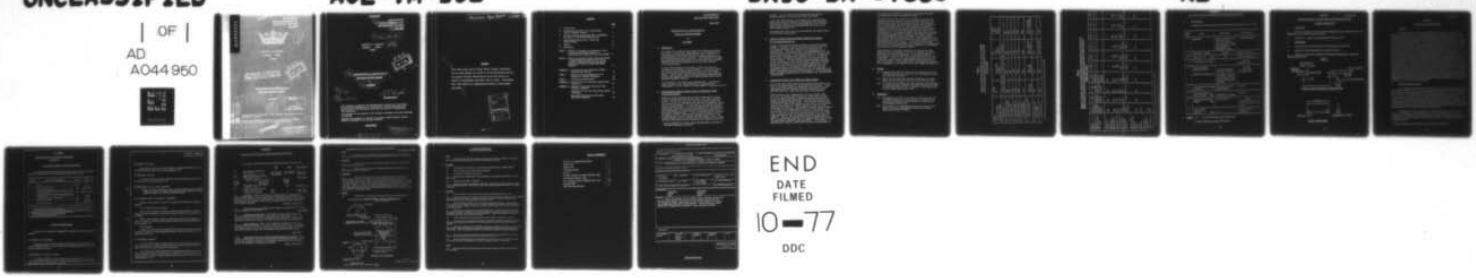

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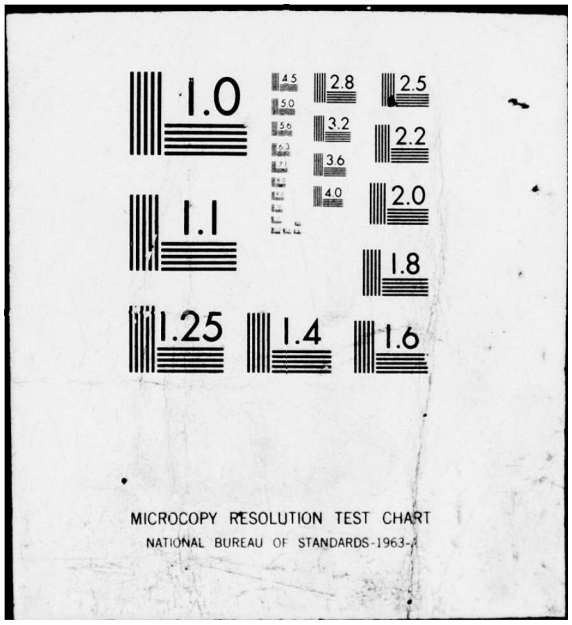
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Technical Memorandum No.102
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April 1977

ADMIRALTY OIL LABORATORY
FAIRMILE COBHAM
SURREY

STANDARDISATION AND COMPATIBILITY OF WATER WASH RESISTANT GREASES

by

A.W.MORGAN

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ADMIRALTY OIL LABORATORY
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(6) STANDARDISATION AND COMPATIBILITY OF WATER WASH RESISTANT GREASES.

by

(10) A.W. MORGAN

(18) DRIC

(19) BR-57885

R.P. Langdon

Superintendent.

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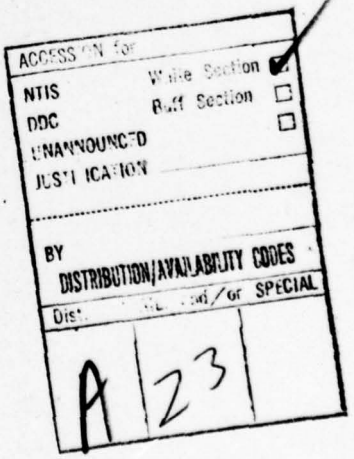
ABSTRACT

Water Wash Greases used by Canada, France, Germany, Netherlands and the United Kingdom were tested to the UK Specification DGS 327. The greases of France, Netherlands and the UK were found to be similar and standardised under NATO Code No. G-460. Tests showed that there should be no compatibility problems if these greases are mixed.



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ABCA/3/RN/GR2/77

AOL Project No. 7807/-/0583

April 1977

STANDARDISATION AND COMPATIBILITY OF WATER WASH RESISTANT GREASES

by

A.W.MORGAN

1. INTRODUCTION

As a member of the NATO Military Agency for Standardisation(MAS) Naval Fuels and Lubricants Working Party, the UK represented by the Admiralty Oil Laboratory* was asked in 1975 to carry out a standardisation study of the water wash resistant greases in use by UK, Netherlands, France and Canada. The results of this study were reported to NATO.MAS members on 8.4.76 under letter reference 7807/NATO 1/76/CEC, and discussed at the June 1976 meetings of the Working Party.

At these 1976 meetings the UK agreed to obtain and test for acceptability the grease in use by Germany. It was also pointed out that the type of grease used by the UK and the Netherlands could have compatibility problems when mixed with other types of grease. Both of these items of work were tackled simultaneously and reported together on 14.2.77 to NATO.MAS members under letter reference 7807/NATO 1/77/CEC.

For convenience, both reports are combined below. The results appear in Table 1 and 2 and summaries of the specification requirements of the UK, France and Canada appear as Appendices A,B & C.

2. STANDARDISATION STUDY OF UNITED KINGDOM, NETHERLANDS, FRENCH AND CANADIAN GREASES

Samples of grease obtained from the above countries were tested to the UK specification DGS 327 for Grease, Sea Water Resistant XG-286. At the time the UK had only one qualified product and this was and still is essentially the same as the commercial grease used by the Netherlands. It is therefore not surprising that the results obtained (Table 1) on these two greases are very similar, both greases complying with every requirement of the specification. The French grease is a different kind of lime-base grease with a much higher Dropping Point. It was a borderline pass in the Water Resistance and Steel Corrosion test and gave an inferior rating (2 compared with 0) in the Dynamic Anti-Rust (Emcor) test. The Canadian grease passed the latter test with ratings of 0 but failed the Water Resistance and Steel Corrosion with corrosion in all six

* Now The National Gas Turbine Establishment(Cobham), Chemistry & Petroleum Technology Department.

craters. It also failed the Oil Separation test and its Worked Penetration was outside the limits for XG-286.

At the June 1976 meetings it was agreed that a new NATO code number G-460 would be assigned for Greases Sea Water Resistant, with products obtained under the specifications of the UK and France being accepted as standardised under the terms of the NATO agreement Stanag 1135.

The Netherlands would use the UK specification and Belgium would use the French specification.

3. TESTING OF GERMAN GREASE 9150-066(A COMMERCIAL EP GREASE) TO UK SPECIFICATION DGS 327

It will be seen from the results obtained on the above grease (Grease A in Table 2) that it failed both corrosion tests and its Worked Penetration was outside the limits set by the specification. Also as a result of the compatibility tests reported below, it transpired that the grease 9150-066 has a very poor working stability. After only 500 strokes in a mechanical grease worker its penetration increased by 38 - an increase of 50 is usually the maximum permitted after working a grease for 100,000 strokes. The poor working stability probably explains the poor performance in the Water Resistance and Steel Corrosion test as such a grease would be more easily removed from a flat surface by a jet of water and thus permit corrosion to occur. The Dropping Point of the grease is over 300°C but this high temperature capability is not likely to be of any advantage in the type of application intended for these greases. It was concluded that this German grease should not be included under the NATO G-460 classification.

4. COMPATIBILITY TESTS ON UK, FRENCH AND GERMAN GREASES

By the time these tests took place a second product (Grease C in Table 2) had been approved to the DGS 327 specification. As the work on the German grease was proceeding at the same time, its unsuitability was not realised until the compatibility tests were well under way - hence its inclusion in the programme.

50/50 mixtures of all combinations of the four greases (A/B, A/C, etc in the Table) were produced by working equal volumes of the two greases concerned (which had already been worked 60 strokes for the Worked Penetration) a further 500 strokes in the standard mechanical grease worker. The individual greases were also worked a total of 560 strokes in order that a true comparison could be made between the results obtained on them and those obtained on the mixtures. This showed the German grease (Grease A in the Table) to be incompatible with all the other greases -it will be seen that in every case its mixture with another grease (A/B, A/C and A/D in the Table) was much softer (i.e. had a much higher penetration) than the softest individual grease which was Grease A. This is the accepted definition of incompatibility - where a significantly worse result is obtained from a mixture than the worst result obtained on any one product. Only Grease A produced such a result in these tests and only the consistency of

the mixture was affected in this way - with every other test an intermediate result was usually obtained.

The French grease will be seen to be compatible with both UK greases, but its performance in both the Water Resistance and Steel Corrosion test and the Dynamic Anti-Rust test was poor. When the same grease was tested twelve months earlier (Table 1) it gave much better results. Apart from aging, a probable explanation is that on the earlier occasion the first test was carried out on grease worked 60 strokes (as laid down in the specification). As already mentioned, the later tests were done on individual greases worked a total of 560 strokes in order to get a true comparison with the mixtures. The extra working of the French grease resulted in a softer sample (penetration of 280 compared with 265) which probably had less resistance to being washed away by the jet of water. This extra working should not have affected the performance of the grease in the Dynamic Anti-Rust test as it represents only a small proportion of the working the grease gets in the apparatus itself.

Extra working of the German grease may well account for some reduction of its performance in the Water Resistance and Steel Corrosion test, but the superiority of the French grease in this respect is shown by the effect of mixing them with the two UK greases. It will be seen that mixtures B/D and C/D did well in both the steel corrosion tests whereas mixtures A/B and A/C gave poor results. This indicates that the corrosion properties of D, although not up to those of B and C are better than those of A.

5. SUMMARY

5.1. Compatibility tests have shown that no problems exist when the grease used by both the UK and the Netherlands is mixed with that used by France.

5.2. Apart from its poor anti-corrosion properties, the German grease was not compatible with the UK and French greases.

5.3. The French grease failed both steel corrosion tests although it passed the Water Resistance and Steel Corrosion test when it was first tested in 1976. Mixtures of this grease with both UK greases passed both tests.

6. CONCLUSIONS

6.1. The physical properties of the French, Netherlands and UK Water-Wash greases are close enough for the greases to be considered Standardised Products under the terms of the NATO agreement Stanag 1135.

6.2. There should be no compatibility problems if there is any mixing of products standardised as Water Wash Greases under the NATO Code No G-460.

TABLE 1

RESULTS OF TESTING UK, NETHERLANDS, FRENCH & CANADIAN WATER-WASH GREASES TO SPECIFICATION DG SHIPS 327 FOR GREASE XG-286

Grease Country of origin Laboratory No.AOL/	XG-286 UK -	* Netherlands 2028/75	GA1 France 2266/76	3-GP-664 Canada 1820/75
1. Appearance	Smooth, homogeneous, and free from visible impurities			
2. Penetration worked	289	268	265	302
3. Drop Point, °C	96	95	140	198
4. Oil Separation, %	2.36	1.45	0.59	11.2
5. Copper Corrosion	Pass	Pass	Pass	Pass
6. Low Temperature Pumping Properties	Pass	Pass	Pass	Pass
7. Water resistance and steel corrosion	Pass - no corrosion	Pass - no corrosion	Pass -corrosion in a crater	Fail -corrosion in all 6 craters
8. Dynamic Anti-rust test rating	0,0	0,0	2,2	0,0
9. Water Content, %	1.00	1.40	less than 0.05	0.50

* One of the two products aporoved to the UK specification DGS 327.

TABLE 2

RESULTS OF TESTING A GERMAN WATER-WASH GREASE TO SPECIFICATION DG SHIPS 327 FOR GREASE XG-286 & COMPATIBILITY TESTS BETWEEN UK, NETHERLANDS, FRENCH & GERMAN WATER-WASH GREASES

Grease	A	B*	C	D	A/B	A/C	A/D	B/C	B/D	C/D
Country	Germany	UK	UK	France	-	-	-	-	-	-
Specification	9150-066	DGS.327	DGS.327	STM.7420	-	-	-	-	-	-
Soap type	Calcium complex	Calcium tallow	Mxd calcium soaps	Calcium hydroxy stearate	-	-	-	-	-	-
Penetration worked	256	278	287	267	-	-	-	-	-	-
Penetration after further 500 strokes	294	279	281	280	344	328	314	299	281	282
Dropping pt °C	>300	94	101	147	300	300	300	110	118	141
Oil Separation %	0.1	1.6	4.7	1.5	0.6	2.3	1.0	4.3	1.7	2.1
Water Resistance & steel corrosion	Fail-corrosion in 6 craters	Pass-no corrosion	Pass-no corrosion	Fail-corrosion in 6 craters	Fail-corrosion in 4 craters	Fail-corrosion in 6 craters	Fail-corrosion in 6 craters	Pass-no corrosion	Pass-no corrosion	Pass-No corrosion
Dynamic anti-rust test with 5% Na Cl rating	3,3	0,0	0,0	3,4	2,2	3,2	3,3	0,0	0,1	0,0
Copper corrosion	Pass									
Low temperature pumping properties	Pass									
Water content %	0.8									

* The same product as used by the Royal Netherlands Navy.

d. Requirements

A sample taken from any portion of the product shall comply with the following:-

TEST NO	TEST	TEST LIMIT	TEST METHOD
1	Appearance	Smooth, homogeneous, free from lumps, abrasive particles and other impurities, scenting material or objectionable odour.	Visual examination
2	Penetration, worked	265-295	ASTM D 217/IP 50
3	Drop point, °C min	87	ASTM D 566/IP 132
4	Oil separation, per cent	3	-/IP 121 7 days at 40°C
5	Copper corrosion: Condition of grease Condition of copper strip	No green colouration or change in texture. No pitting, etching, or dark brown, green or black staining. Slight brown staining is permissible.	- /IP 122 (BS 4455) 24 hours at 60°C
6	Low temperature pumping properties	The grease shall be easily pumped.	Annex A
7	Water resistance and steel corrosion max	Corrosion in 1 crater	Annex B
8	Dynamic anti-rust test rating max	※ Rating of 0	- /IP 220 (with 5% NaCl in water instead of pure distilled water).
9	Water content, per cent max	1.5	ASTM D95/IP 74 (BS 4385)

NOTES 1. ※ To be used for type approval tests only.

2. Room temperature means 15°C to 25°C.

METHOD FOR THE DETERMINATION OF LOW TEMPERATURE PUMPING PROPERTIES

1. APPARATUS

a. Grease gun- pom pom, Type H (Tecalemit Engineering Ltd), obtainable on loan by application to the Quality Assurance Authority.

b. Refrigerator - capable of being maintained at minus $5 \pm 1^{\circ}C$.

2. PROCEDURE

a. Fill the gun with grease and place in the refrigerator at minus $5^{\circ}C$.

b. Maintain at the test temperature for twenty four hours.

c. Remove the gun from the refrigerator and operate it immediately, (protective gloves should be worn).

ANNEX B

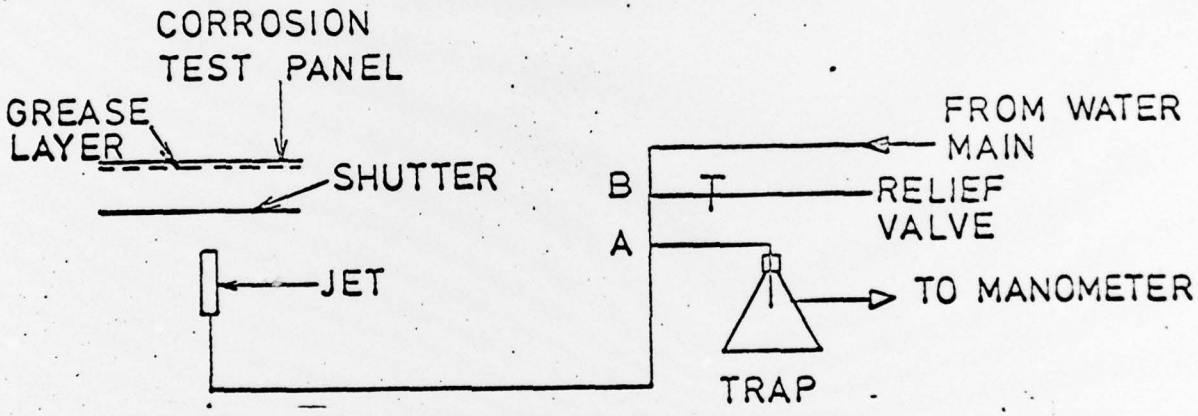

FIGURE 1 LAYOUT FOR CORROSION PREVENTION TEST

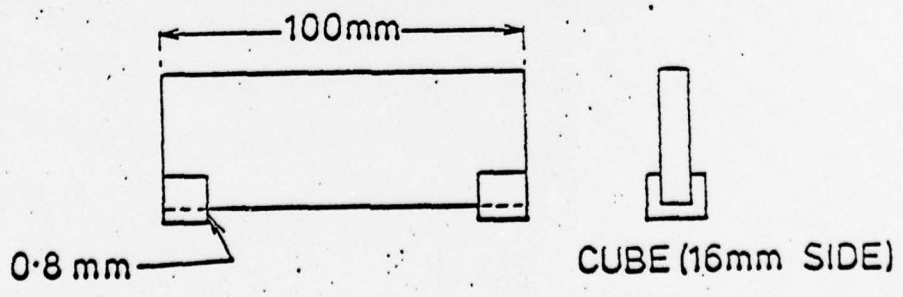

FIGURE 2 DOCTOR BLADE

ANNEX B

CORROSION PREVENTION TEST

1. METHOD

The apparatus used is shown diagrammatically in Figure 1. The jet, which consists of a brass cylinder 50 mm long through which a hole 1.6mm diameter has been bored centrally is clamped so that its upper end is 76 mm from the lower surface of the corrosion panel and is so supported that the issuing stream of water impinges vertically upwards on to the panel normal to the surface. Pressure tubing, 6.5mm internal diameter, shall be used throughout the flow line, the length used between A and the jet being 600 mm; sharp bends shall be avoided. The distance between A and B shall be at least 150 mm and the T-pieces at A and B shall also have an internal diameter of 6.5 mm $\pm$ 0.2 mm. The junction A to the manometer should be at the same horizontal level as the tip of the jet. Arrangements are made so that a shutter can be placed between the jet and the panel. The pressure of the water is first adjusted approximately by means of the main tap and is finally adjusted to 178 mm of mercury using the relief valve. With the shutter in position, the jet is allowed to run for a few minutes until the pressure, as registered on the manometer, is steady at this value. The steel corrosion panel at room temperature* prepared as described below is then clamped in position and is exposed to the jet for 30 seconds by operating the shutter. Three tests are carried out on each of two panels, the craters being evenly spaced along the lengthwise centre line. The panels are then supported horizontally some distance from the bottom of a vessel which can be hermetically sealed and the craters are filled with sodium chloride solution made by dissolving 5 grams of the salt in 100 ml of distilled water; 50 ml of the solution are also placed in the bottom of the vessel to prevent change in concentration of the crater solution. The vessel is maintained at room temperature* and after 48 hours the craters are inspected for signs of rusting and corrosion. The temperature of the jet water shall not be less than 10°C and not more than 15°C, and the test shall be carried out at room temperature.*

2. PREPARATION OF PANEL

A test panel which is of mild steel about 150 mm x 100 mm x 18 BG is prepared for this test as follows: the panel is first degreased with toluene and dried; the surface to be used is then rubbed lengthwise with No 0 emery cloth to remove any tarnishing which may be present. It is then wiped free of any remaining emery dust. This procedure is repeated using No 00 emery cloth and rubbing across the panel at right angles to the marks already made until these are obliterated. The surface is then polished in a lengthwise direction using No 150 carborundum powder applied by a pad of cotton wool moistened with 100/120 petroleum spirit. Successive pads of cotton wool are used subsequently to the one with which the powder was applied until a pad remains unsoiled after having been rubbed against the panel. The surface is then washed with acetone.

The grease to be tested is worked in a standard IP grease worker (60 double strokes of the plunger) at room temperature* and is spread evenly on the panel with a palette knife, care being taken not to include any air bubbles. A doctor blade (see Figure 2) is then drawn over the grease to leave a film 0.8 mm thick. The panel is then ready for testing as above.

* For these purposes room temperature shall be taken as 15°C-25°C.

APPENDIX B

FRENCH GREASE FOR UNDERWATER APPLICATIONS

STM 7420 A

4. CARACTÉRISTIQUES PHYSICO-CHIMIQUES

Les caractéristiques physico-chimiques de la graisse pour articulations immergées doivent être comprises dans les limites mentionnées dans le tableau ci-après :

Repère	Caractéristiques physico-chimiques	Limites	Méthodes
1	Couleur	Verte	(1)
2	Point de goutte minimal, °C	125	NF T 60-102
3	Pénétration travaillée (60 cycles)	(2)	ASTM D 217-60 T
4	Viscosité apparente maximale en poises à –10 °C pour un taux de cisaillement de 20 sec-1	1 000	ASTM D 1092-56 T
5	Stabilité à 40 °C pendant 7 jours. Pourcentage maximal en poids d'huile séparée	2	IP 121/57
6	Corrosion sur lame de cuivre, 3 heures à 100 °C	(3)	IP 112/56
7	Teneur en cendres sulfatées	(2) (4)	NF 60-111 (méthode B)
8	Teneur en agent gélifiant	(2) (5)	ASTM D 128-57

(1) Une couleur appropriée peut être obtenue par l'addition à un produit pâle de 2 °/₀₀ de vert organol solide.
(2) Déterminée pour servir de caractéristique d'identification.
(3) Les résultats de cet essai sont appréciés conformément aux indications de la norme NF M 07-015. L'altération de la lame après essai doit être au plus égale à celle qui correspond à l'aspect 2c.
(4) Les métaux présents dans le résidu sulfaté sont identifiés.
(5) La nature de l'agent gélifiant est identifiée.

5. ESSAIS PARTICULIERS

La graisse pour articulations immergées doit satisfaire aux essais particuliers suivants :

5.1. Résistance à l'oxydation.

Lorsque la graisse est soumise à l'action de l'oxygène dans les conditions fixées par la norme ASTM D 942-50, la chute de pression de la bombe après 100 heures d'essai doit être inférieure à 0,7 bar.

5.2. Résistance au lavage par l'eau.

La résistance qu'offre la graisse au lavage par l'eau, appréciée dans les conditions de la norme ASTM D 1264-53 T, doit être telle que le pourcentage de graisse entraînée soit inférieur à 5 % à la température de 37,8 °C.

5.3. Stabilité au travail.

Après 100 000 cycles de travail de la graisse, la pénétration déterminée suivant la méthode ASTM D 217-60, ne doit pas être supérieure à 375.

5.4. Particules abrasives.

Le nombre de particules abrasives déterminé dans les conditions de l'essai décrit en annexe 1 ne doit pas être supérieur à 15.

5.5. Écoulement par un orifice annulaire.

— Après dix minutes d'écoulement à travers un orifice annulaire dans les conditions définies en annexe 2, la pression d'écoulement doit rester pratiquement constante pendant 20 minutes et avoir une valeur inférieure à 80 bars.

5.6. Protection contre la corrosion et discrétion.

Soumise à l'essai défini en annexe 3, la graisse doit satisfaire aux exigences suivantes :

5.6.1. *Protection contre la corrosion.*

5.6.1.1. Avant nettoyage au benzène, la surface exempte de dépôts et corrosions, relative aux quatre éprouvettes, ne doit pas être inférieure à 80 % de la surface totale de celles-ci.

5.6.1.2. Après nettoyage au benzène, aucune des éprouvettes ne doit présenter de taches de corrosion et le nombre total de piqûres relevées sur les quatre éprouvettes ne doit pas dépasser 12.

5.6.2. *Discrétion.*

A l'issue de chaque passage des éprouvettes dans la cuve à eau de mer, on ne doit pas noter la présence de taches superficielles huileuses recouvrant plus de 5 % de la surface libre de la cuve.

5.7. Propriétés anti-usure.

5.7.1. La charge moyenne de Hertz, déterminée sur une machine à quatre billes dans les conditions de la méthode FS 6503, du recueil de normes FED-TEST METHOD STD n° 791, ne doit pas être inférieure à 50 décanewtons.

5.7.2. L'usure d'un couple d'engrenages en cupro aluminium lubrifié avec la graisse dans les conditions définies en annexe 4 doit être inférieure à 2 mg pour la première période d'usure, 3 mg pour la seconde période sans que la somme de ces deux usures soit supérieure à 4 mg.

APPENDIX C

CANADIAN GREASE HEAVY DUTY WATER WASH RESISTANT 3-GP-664

The grease shall comply with the following detail requirements:

		Min	Max	Test Method
4.1	Penetration (Worked) at 77°F (25°C)	310	340	ASTM D217
4.2	Dropping Point, °F (°C)	250 (121.1)	-	ASTM D566
4.3	Apparent Viscosity at 0°F (-17.8°C), poises			ASTM D1092
4.3.1	Rate of shear, 25 $sec.^{-1}$	-	10,000	
4.3.2	100 $sec.^{-1}$	-	6,000	
4.3.3	500 $sec.^{-1}$	-	3,000	
4.4	Separation, 50 hr at 212°F (100°C), % by wt	-	8.5	3-GP-0/73.2
4.5	Viscosity of Base Oil at 100°F (37.8°C), cSt	195	-	ASTM D445
	(Approx SU seconds)	904	-	ASTM D2161

4.6 Corrosion - After immersion of a copper strip in the grease at 100°C (212°F), for 24 hours, there shall be no green discoloration of the grease in the vicinity of the copper strip. The copper strip, after removal of the grease with toluene, shall show no pitting, etching nor dark brown, black or grey staining.

3-GP-0, Method 60.10

4.7 Rust Preventive Properties - When tested as prescribed, the grease shall be rated No. 1 or better.

ASTM D1743

4.8 Load-Carrying Capacity - The Timken OK load shall be not less than 50 pounds when determined in accordance with ASTM D2509. An acceptable alternative test for Extreme Pressure Properties is ASTM D2596 and when tested by this method, the Load Wear Index shall be 40 minimum.

4.9 Shear Stability - When a 75 g sample is subjected to the Roll Stability Test for 4 hours at 160 rpm at 150 ± 2°F (65 ± 1°C), the Worked Penetration (full scale units) shall be not more than 20 points higher nor more than 60 points lower than the original Worked Penetration value.

ASTM D1831

4.10 Water-Wash Resistance and Sea Water Corrosion Protection - When tested as prescribed, the grease shall provide a continuous coating at the end of the water-wash sequence, and complete corrosion protection during the 24 hour exposure to synthetic sea water.

3-GP-0, Method 49.6

SEPARATION OF OIL FROM LUBRICATING GREASES (BLEEDING)

Method 73.2a 3-GP-C

1. Scope

1.1 This method is intended for measurement of the tendency of lubricating oil to separate from lubricating greases at elevated temperatures under static conditions.

2. Apparatus

2.1 Cone, 60 mesh screen* constructed of nickel, monel or stainless steel in accordance with Figure 1.

2.2 Oven, gravity convection, with apparatus suitable for maintaining the temperature at 100°C for 30 hours.

3. Procedure

3.1 Weigh 10 g of grease into the cone. Shape the exposed surface of the grease so that it is smooth and convex to prevent trapping of free oil. Suspend the cone in a clean, tared, 200 ml lipless beaker by means of wire handles attached to a hook in a close-fitting beaker cover. Place cone and beaker in the oven and maintain at 100°C (212°F) for 30 hours. At the end of this time, remove the cone and beaker and cool in a desiccator. When the assembly has reached room temperature, lift the cone from the beaker and touch it against the inside edge of the beaker to remove any oil adhering to the tip of the cone. Reweigh the beaker.

4. Report

4.1 Calculate per cent bleeding in accordance with the following formula:

$$\text{Per cent Bleeding} = \frac{(\text{final wt of beaker} - \text{initial wt of beaker}) \times 100}{\text{Initial wt of grease}}$$

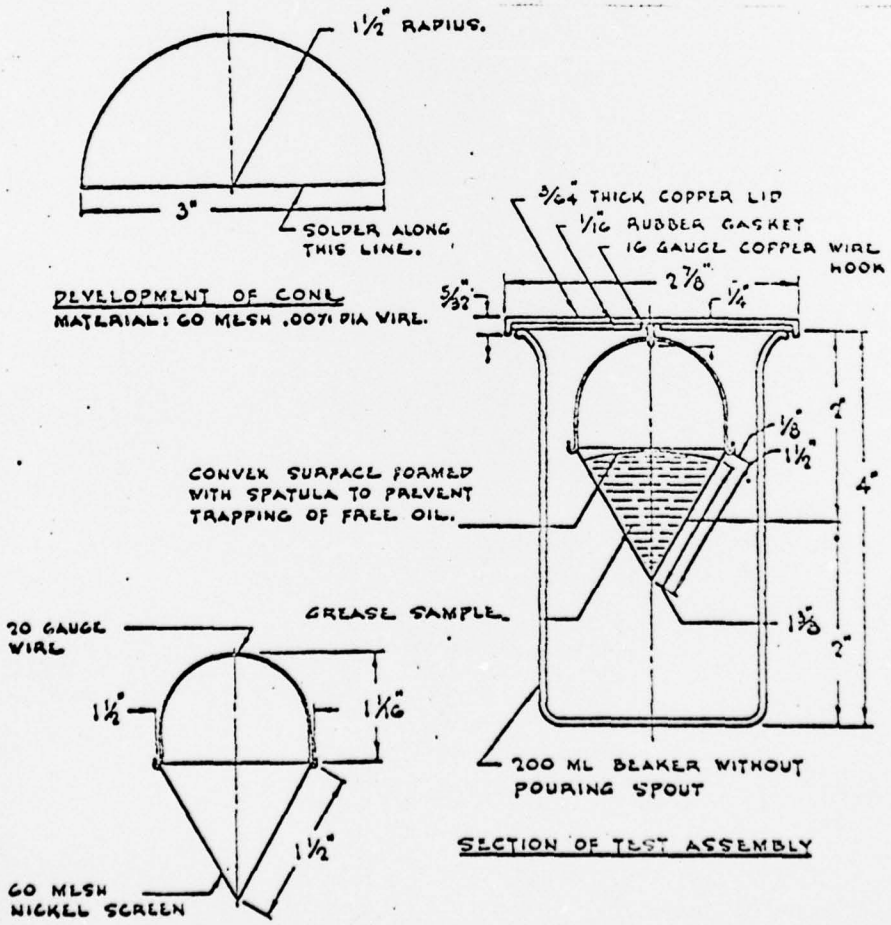

Figure 1

BLEEDING TEST APPARATUS

WATER WASH RESISTANCE AND SEA WATER CORROSION PROTECTION

1. Scope

1.1 This method is intended for assessing the ability of a grease to maintain a continuous film, and to prevent corrosion of steel under the conditions of the test.

2. Materials

2.1 Steel specimens as described in ASTM D665 and fitted with Type 1 specimen holders.

2.2 150 grit alundum cloth as prescribed in ASTM D665.

2.3 Drill press with variable speed drive.

2.4 Grease coating thickness-control jig consisting of a 0.560 inch hole drilled in a flat plate or bar.

2.5 Apparatus as described in ASTM D665.

2.6 Synthetic sea water as prescribed in ASTM D665. (Synthetic sea water having a pH higher than 8.2 should be discarded. High pH such as this, occasionally arises from the use of old stock solutions.)

3. Procedure

3.1 Wash the surface of a new specimen with stoddard solvent (3-GP-8) and air dry.

3.2 Mount the specimen in the drill press chuck and while rotating the specimen at 1725 ± 100 rpm, apply the alundum cloth lightly to provide a new surface. Finish by wiping the surface with a clean lintless material wetted with stoddard solvent (3-GP-8).

3.3 Lower the specimen through the centered grease coating jig and apply a layer of grease to the specimen with a spatula. Then raise the specimen slowly while rotating it at 10 rpm until it is clear of the jig. Remove the jig and strike off the grease about 1/8 inch below the bottom end of the specimen.

3.4 Pour 900 ml of the distilled or de-ionized water into a 1 liter stainless steel beaker and position it below the specimen so that when the specimen is lowered there will be 1 inch from the side of the beaker to the closest edge of the specimen. Immerse the specimen to a depth of about 4-1/4 inches and lock the press in position.

3.5 Rotate the specimen at 4300 ± 200 rpm or 120 ± 2 minutes in the water at 70 ±5°F.

3.6 At the end of the rotational period raise the specimen and record the continuity of the grease coating, discounting the water-air interface region and 1/8 inch at the lower end of the specimen.

3.7 Transfer the specimen to the ASTM D665 apparatus and immerse it in synthetic sea water as in ASTM D665. Suspend the specimen by means of a pin through the predrilled hole and secure it with a clamp. Start the stirrer and maintain the sea water temperature at 70 ±5°F for 24 hours.

3.8 At the end of the period, remove the specimen and record the appearance of the grease coating, noting particularly the location and extend of rusted areas.

3.9 Wash the remaining grease from the specimen with stoddard solvent, blot dry with clean filter paper and record the appearance and extend of rusting as detailed in ASTM D665.

4. Report

4.1 Report the degree of grease wash-off and corrosion protection afforded the specimen by the test grease.

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ABSTRACT Water Wash Greases used by Canada, France, Germany, Netherlands and the United Kingdom were tested to the UK Specification DGS 327. The greases of France, Netherlands and the UK were found to be similar and standardised under NATO Code No.G-460. Tests showed that there should be no compatibility problems if these greases are mixed.

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